BIBLIOGRAPHICAL NOTICE.

Zoological Results based on Material from New Britain, New Guinea, Loyalty Islands, and elsewhere, collected during the Years 1895, 1896, *and* 1897, *by Arthur Willey, D.Sc. Lond., Hon. M.A. Cantab., late Balfour Student of the University of Cambridge.* Part III. Cambridge, 1899.

The third part of Dr. Willey's 'Zoological Results' contains only three articles, but each of these is in its own way a valuable contribution to zoological literature.

The first paper is by Dr. Hans Gadow and is entitled "Orthogenetic Variation in the Shells of Chelonia." Dr. Gadow bases his remarks on an examination of the shells of 20 newly-hatched specimens of the Loggerhead (*Thalassochelys caretta*), collected by Dr. Willey from one nest in New Britain, and of numerous individuals of various ages in different museums. Altogether his material comprised 76 specimens. The arrangement of the epidermal scutes in these specimens showed considerable variation, especially in the younger individuals, and Dr. Gadow, looking upon these variations as atavistic, draws from them important conclusions as to the evolution of the carapace in the Chelonia. The gist of these conclusions is contained in the following extract:—

"At an early ancestral stage, not necessarily that of the primordial Chelonian, the plates and scutes of the back were arranged as follows:—All the metameres carried originally a series of transversely arranged dermal plates and scutes, which in the region of the trunk, according to the greater bulk of the body, increased in size, converging towards the root of the neck and upon the tail. About 14 metameres were distinguished by the greater size of the dermal plates, each transverse series consisting of a median or neural and three pairs of lateral elements, in all eight. The median pair fused into an unpaired neural. The next lateral pair became the costal, the outermost or most lateral the marginal set. The intermediate row between these two still survives in some recent genera as the so-called supramarginals; it became gradually suppressed owing to the increasing size of the costals.

"The last costals, say those of the 15th to 20th metameres, became likewise suppressed in conformity with the shaping of the trunk; the three last neurals were turned into pygals and the last pair of marginals closed round the posterior end . . . . A similar reduction seems to have taken place at the root of the neck . . . .

"A later phylogenetic stage would be characterised by the suppression of the supramarginals, and by the reduction from eight to seven to six and ultimately to even less transverse series of epidermal scutes, while the constituting elements of the dermal armour after having been welded into the formation of the carapace remain comparatively constant."

A remarkable feature of this process of reduction of the epidermal scutes is that it takes place (in the life-history of the Loggerhead) not by loss of scutes at either end, but by the elimination of elements

from the midst of the series, viz. in the region of the original 2nd, 5th, and 7th transverse rows.

The second and longest communication is by Dr. Willey himself, on "Enteropneusta from the South Pacific, with Notes on the West-Indian species." After a few introductory remarks Dr. Willey proceeds to a synopsis of the families and genera of Enteropneusta, recognizing in the group three families: the Ptychoderidæ, Spengelidæ, and Balanoglossidæ. Next comes the systematic description of several South-Pacific species, including three not previously described, and some notes on the West-Indian forms, with descriptions of two new species. Finally, under the heading of "Morphology of the Enteropneusta," there is a lengthy discussion of the various features of the group which betray a relationship with the Chordata. In the specific descriptions, which are very full and careful, and include remarks on the colour and œcology of the animals, very great attention is paid to internal features.

The pages devoted to theoretical questions are beyond doubt a most important contribution to the discussion on the vexed question of the ancestry of the Chordata. The matter is divided into nine heads, dealing respectively with the gill-slits, the proboscis pores, the origin of the vertebrate kidney, the nervous system, the fate of the genital pleuræ of Enteropneusts, the neurenteric canal of vertebrates, the notochord, the branchial bars, and the endostyle. Throughout the discussion the dominating idea is that of the change of structure of an existing organ with its change in function. An origin *de novo* is not postulated for any structure, but a number of characteristic chordate features are derived from pre-existing enteropneustan organs, on the supposition of a change of function.

It is not possible here to do more than touch shortly on each of the heads we have mentioned above, but some indication of Dr. Willey's views on these points will probably be welcome to many. In treating of the gill-slits it is sought to show that they were at first unlimited in number and coextensive with the gonads, the oxygenation of which, and not respiration, was their primary function. In the second section, on the proboscis pores, it is claimed that the pore-canal of the proboscis of Enteropneusta is homologous with the neuro-hypophysial canal of the ascidian larva (the "primordium" of the adult subneural gland), the proboscis pore being here represented by the pore leading from the neurohypophysial canal into the cerebral vesicle. In *Amphioxus* the proboscis pore-canal has become Kölliker's olfactory pit, into which the neural canal opens by the neuropore. The view that the preoral pit of the larva represents the left division of the head-cavity is upheld, and the latter is compared with the left proboscis cœlome of the Enteropneusta. The opening of the preoral pit to the exterior represents the communication between the cœlome and the pore-canal. The nephric tubules of *Amphioxus* (and so of the Chordates) are derived from a series of "regional pore-canals" continuous with that comprising the proboscis, collar, and truncal pores (proto-, meso-, and opisthomeric pores). It will be seen that

Dr. Willey's speculations bring to a climax the extremely interesting series of researches on the primary divisions of the chordate cœlome and their communications with the exterior which we owe to various members of the Cambridge school.

Treating of the central nervous system, the following conclusion is reached :—"The medullary tube of the collar of Enteropneusta is the homologue of the cerebral vesicle only of *Amphioxus* and the ascidian tadpole, and probably represents no more than the primary fore-brain (thalamencephalon) of Craniota; the roots of Ptychoderidæ are genetically related to the epiphysial complex of Craniota; in the crucial nuchal region of the Enteropneusta are therefore to be found not the actual but the nearest possible approximation to the actual primordia of the hypophysis cerebri and of the epiphysis cerebri of Craniota." The genital pleuræ of Enteropneusta and their fate are discussed at some length, but not fully, and the conclusion that "the genital folds of Enteropneusta, the atrial folds of Amphioxus, and the medullary folds of Vertebrata belong to the system of pleural folds of the body-wall, and are differentiated from a common primordium," is hinted at rather than demonstrated. The medullary tube of Enteropneusts is in some cases formed by the closing in of medullary folds, and the continuation of this process backward would bring the posterior neuropore into association with the blastopore (primitive anus) and form the neurenteric canal. With regard to the notochord of Enteropneusts there are some very interesting observations. This structure, which is a complex one, is considered to have been originally a portion of the postoral gut, the anterior part representing the functional œsophagus of the Actinotrocha. The ventral cæcum represents that of the Actinotrocha of *Phoronis Sabateri*; the lateral pouches are the vestiges of a pair of postoral but pretrunal gill-slits, and are represented in Actinotrocha by the "pleurochords" and in *Cephalodiscus* by actual gill-slits. The notochord of *Cephalodiscus* is related to the vermiform process of the notochord of Enteropneusta. The tongue bars of the gill-slits are organs of respiration, developed on the assumption of the latter function by the slits. In *Amphioxus* they have already become ontogenetically secondary structures, and in the Craniota they are transformed into the thymus. The parabranchial ridges of the Enteropneusta are homologous with the endostyle of Cephalochorda and Tunicata. It will be easily understood from the above remarks that Dr. Willey regards the Enteropneusta as not merely allied to the Chordata but "much nearer the direct line of Chordate descent than has generally been supposed."

The last of the three articles in the volume is by Mr. A. E. Shipley, on the Echiurids collected by Dr. Willey. Mr. Shipley's paper contains a short report on the five species of Echiurids in the collection, none of which are new, and a valuable revision of the group, including a key to the genus *Thalassema* and some remarks on the distribution of the genera. L. A. B.